Methods and Themes in Child Psychology

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Psychology 216

Developmental Psychology Methods: Lecture Objectives

- Scientific inquiry and knowledge
  – What is the scientific method?
  – What values and assumptions come with it?
- Research Methods
  – What research methods are used?
  – What are the strengths and weaknesses of these methods?
- Overarching Themes
  – What enduring questions does the field address?
  – Why are these questions important?

THE SCIENTIFIC METHOD AND EMPIRICAL KNOWLEDGE

Knowledge

"The question how knowledge should be defined is perhaps the most important and difficult … with which we shall deal. This may seem surprising: at first sight it might be thought that knowledge might be defined as belief which is in agreement with the facts. The trouble is that no one knows what a belief is, no one knows what a fact is, and no one knows what sort of agreement between them would make a belief true..."

Bertrand Russell, *Theory of Knowledge (1926)*

The Scientific Method

- An approach to testing beliefs (the approach we will value in this class)
  – 1. Choosing a question to be answered
  – 2. Formulating a hypothesis regarding the question
  – 3. Developing a empirical method for testing the hypothesis
  – 4. Using empirical data yielded by the method to inform the hypothesis

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The Scientific Method

- Assumptions
  – All beliefs can be wrong
  – Until tested, should be considered hypotheses
  – If tested and and not supported by evidence, belief should be abandoned no matter how reasonable
- Values (worth determined by..)
  – Testable hypotheses
  – Relevant measures
  – Measurable evidence (empirical data)
    - E.g. not personal intuition/emotion/authority

Ethics

- Human subjects issues
  - Responsibility to make sure that the potential benefits outweigh the potential harm
  - Responsibility to have studies reviewed by institutional review board (IRB) before initiating.
    - Beginning in 1974
- Vulnerable populations
  - (children, clinical populations, etc.)
- Unethical examples:
  - Little Albert/White Bunny-Watson (1920)

Questions on Scientific Method?

RESEARCH METHODS AND MEASURES

Research Types: Correlational

- Correlation: an association between 2 or more variables (attributes)
- Logic of correlation
  - Range from -1 to +1
  - The closer to 0 the weaker the association
- Allows for prediction
  - Higher correlation = better prediction
- Major limitation: can NOT establish causation

Limitation 1: Establishing direction of causation

Number of firefighters is positively correlated with the size of the fire

- Alternative 1: More firefighters cause the fire to grow
- Alternative 2: Bigger fires cause more firefighters to be called to a scene.

Limitation 2: Real but spurious correlations

Number of storks is positively correlated with the birth rate in European countries

Number of pirates negatively correlated with global warming (rise in temperature)

Limitation 3: Third/mediating factor in correlations

- The amount of fun a college student has on Friday night is positively correlated with the likelihood of vomiting on Saturday morning
  - Fun causes throwing up?
  - More likely, a mediating factor: drinking

Research Types: Experimental

- Logic of experimentation
  - Manipulate experience received (between groups)
    - independent variable(s)
  - Measure response to experience
    - dependent variable(s)
  - If all other differences between groups are equal, differences in outcome measures can be causally linked to the differences in experience
- Allows for causal inferences to be made
- Limitations to experimental control
  - resources/ethical considerations/etc.

Research Designs in Child Psychology

1. Longitudinal
   - Same children are examined repeatedly over a prolonged time period

Research Designs in Child Psychology

2. Cross-sectional
   - Children of different ages or at one age are studied at a single time point

Research Designs in Child Psychology

3. Microgenetic
   - Children are observed intensively when a developmental change is occurring (usually relatively short time period).

Test Case

- A group of friends claims that Baby Einstein Videos make your baby smarter.
- How could this be tested using each of these designs?
  - Longitudinal Design
  - Cross-sectional Design
  - Micro-genetic Design

Methods: Difficulties in studying children (compared to typical adult studies)

- No language/less developed language
- Limited time constraints
  - Less patient participants/less focus
- Less competent at following instructions
- Rapid change (especially in the first year)
  - Need for precise monitoring of age
- Sensitive population
  - Safety
  - Recruitment

Research measures

- Behavioral
  - Verbal/self-report
    - Yes/no
    - Qualitative
    - Interview
  - Decision/choice
    - Speed/reaction time
    - Accuracy
  - Observation
    - Unstructured Observation
    - Structured Observation

Structured Observation Example: Helping Behavior
(Warneken & Tomasello, 2006)
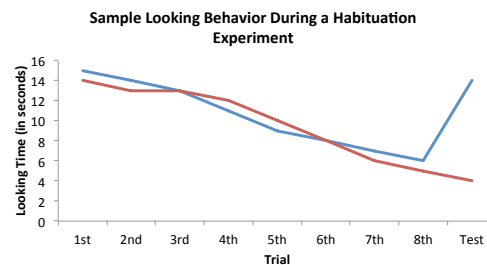
© Warneken & Tomasello

How about infants?

- Limited movement, decision making, and no/little verbal abilities?

- What can they do?
  - Look, hear, suck, turn head/orient

Infant Methods: Habituation

- Repeated presentation of same stimulus until boredom
  - Change property of interest and measure looking response
    - Increase in attention = noticed the change
    - Continued boredom = didn't notice the change
  - EX: color change, orientation change, shape change
 - Variation on visual habituation: non-nutritive sucking

Sample Looking Behavior During a Habituation Experiment

Looking Time (in seconds) vs Trial (1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, Test)

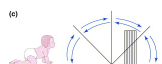## Infant Methods: Violation of Expectation (VOE)

Spelke/Baillargeon

Physically possible vs. physically impossible
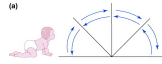
Logic:
Infants are interested in events that violate their expectations
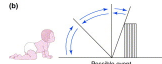
Look longer that those events compared to events that seem normal

EX:
Infants have the expectation that solid objects can not pass through one another.

Look at the impossible event longer


Preferential Looking

Infant Preferential Looking

- Logic: differential looking at the paired pictures indicates that infants notice a difference between them
- Why?
  - Will look at one item/event over another for a variety of reasons
    - Familiarity, personal preference, novelty, more interesting, etc.
  - Studies must be carefully designed and paired with control studies to rule out alternative explanations

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Preferential looking example

- EX: Bar-Haim, Ziv et al, 2006
- Preferential looking study of race with 3 month olds
  - African infants raised in Africa prefer to look at African faces
  - African infants raised in Israel show no difference in looking

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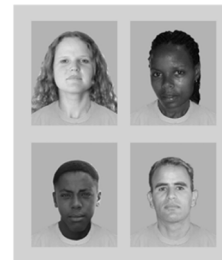
Physiological

- Heart rate
- Cortisol (indicator of stress)
- Respiration rate
- Brain response

Neural

- Neuropsychological (brain damage)
- Electroencephalography (EEG)
- Magnetic Resonance Imaging (MRI/fMRI)
- Near-infrared Spectroscopy (NIRS/fNIRS)

## Nature's Experiments: Brain Damage

How does it happen?
- Birth defect
- Illness
- Stroke
- Accident/Injury
- Lack of oxygen

What can brain damage tell us?
- Tell us about the function of particular brain areas and role in development
- Tell us about mental organization
- EX: Apraxia, Agnosia (Prosopagnosia), Spatial Neglect, Aphasia, Acquired Psychopathy
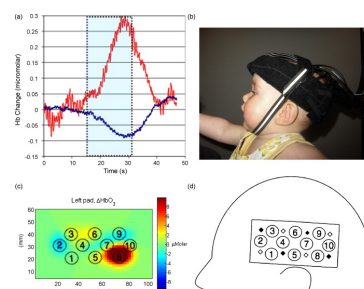
Electroencephalogram (EEG)/ Event-related potentials (ERPs)
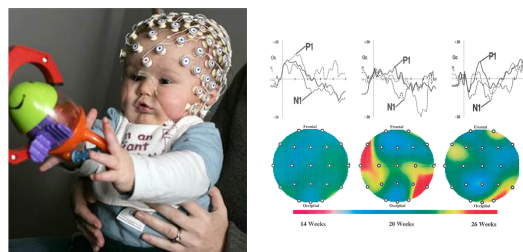
Functional Magnetic Resonance Imaging (MRI/fMRI)
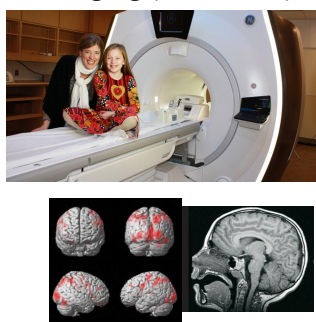
## Near-infrared Spectroscopy (NIRS)

Other Measures: Genetics

- Study of DNA, genes, chromosomes, etc. to understand biological basis of development and disease.
- Behavioral genetics
  - Family studies
  - Twin studies
  - Adoption studies

EX: Family Studies of Specific Language Impairment

- KE Family tree
  - (4 generations)
  - 15 out of 37 suffered from SLI (black nodes)
    - ~41%
  - Prevalence in the general population is ~7%
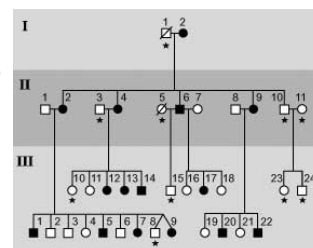
Twin & Adoption Studies

TWIN TYPES
- Monozygotic/Identical
  - share 100% of their genes
- Dizygotic/Fraternal
  - share 50% of their genes

QUESTIONS
- Are identical twins more likely to demonstrate X than fraternal twins?
- Are identical twins raised in the same home more likely to show X than identical twins raised apart (adopted)?
- EX: IQ, sexual orientation, disease

Questions on Methods?

OVERARCHING THEMES

Nature vs. nurture?

- What are some traits you think are completely determined by your genes?
  - Does anyone disagree?
- What are some traits you think are completely determined by your environment?
  - Does anyone disagree?

Nature vs. Nurture: Language

- A vast majority of typically developing humans learn language
- Basic ability to acquire a language depends on genetic makeup (nature)
- Native language (which language you learn to speak) is dependent on the environment (nurture)
- What about language proficiency?
 - Vocabulary?

Overarching Question: Nature vs. Nurture

- Nature: our biological endowment/genetic inheritance
- Nurture: our environment(s)
  - What is our environment?
- Debate is…
  - Not either/or
  - Siegler et al. frames in context of how nature/nurture interact
  - What are the relative contributions of each to development
    - What abilities did evolution and/or genetics give us?
    - What experience(s) are responsible for development?

Nature and Nurture: Far reaching implications

- Understanding/knowledge of development
- Mechanisms of change
- Implications for individual differences
  - Cognitive abilities, IQ, behavior
- Role of environmental and educational conditions
  - Does one teaching style vs. another influence learning of math?
  - Does it matter what parenting style you use?
- Responsibility/Law
  - Should children be charged as adults?
  - Should mentally ill be held responsible?

Continuity/discontinuity over development

Pine tree: Developmental continuity   Butterfly: Developmental discontinuity

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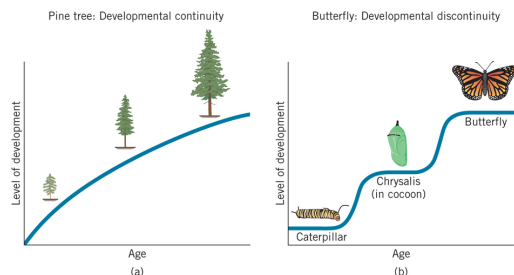
Continuity/discontinuity over development

- Ex: Piaget's conservation of liquid task

Theme: Multiple levels of analysis

- David Marr (1982)-3 levels
- Vision like an information processing system
- EX: How a child learns the alphabet
  - Computational
    - What does the system do/why?
      - Explanation of the behavioral development of gradually learning to identify letters with labels/stages/order etc.
  - Algorithmic/representational
    - How does the system do it?
      - Explanation of how the system calls on ability to represent shapes, visually and distinguish between those shapes, and form associations between shapes and language
  - Physical/Mechanistic
    - How is the system physically realized?
      - Explanation of how single cells, groups of cells, and brain networks send signals to accomplish letter recognize and remember letters.

Scales of study in developmental research

- **Ontogeny**: human lifespan
  - Most well known scale
- Tells us…
  - When developments happen (in lifespan)
  - How developments happen
  - Role of maturation vs. experience in development
  - What changes, what stays the same
  - When practices or policies (experiences) are most are most beneficial or harmful

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Scales in Developmental Research

- **Cross-cultural**: study of different groups
  - Also well known
- Can tell us…
  - What is universal to humans/what varies between humans
  - Role of experience (ex: geography, economy, technology)
  - What practices/policies are most beneficial/harmful

Scales in Developmental Research

- Phylogeny: evolutionary development of species
  - Less well known
- Tells us…
  - When (evolutionarily speaking) abilities appear
  - Human nature- what abilities we share, what abilities are unique
  - Allow for more invasive paradigms
    - Ex: controlled rearing
    - (in some cases) establish stronger evidence for causal relationships than studies of humans

Review

- Scientific inquiry tests beliefs with empirical data
- A variety of measures, including many non-verbal measures, are used to overcome the difficulties in investigating developmental populations
- The nature/nurture debate now focuses on identifying the contributions of genes and experience to development (rather than which one underlies development)

Next 4 Lectures

- Biology, Behavior, and Brain Development I
  - Prenatal and newborn
- Biology, Behavior, and Brain Development II
  - infant, child, and adolescent
- Numerical Development
- Spatial Development